

## United States of America

### DRAFT PROPOSAL FOR THE WORK OF THE CONFERENCE

**WRC-03 Agenda Item 1.33:** to review and revise technical, operational and regulatory provisions, including provisional limits in relation to the operation of high altitude platform stations within IMT-2000 in the bands referred to in No. **5.388A**, in response to Resolution **221 (WRC-2000)**;

**Background Information:** Provisions for operation of high altitude platform stations (HAPS) were originally made at WRC-97 for HAPS providing fixed service (FS) operations in the 47.2–47.5 GHz and 47.9–48.2 GHz bands (**5.552A**). A definition of HAPS was also added to **1.66A**. The use of HAPS as base stations to provide terrestrial IMT-2000 was approved at WRC-2000, resulting in provisions to facilitate this being added to the Radio Regulations (**5.388A**). In accordance with No. **5.388A**, HAPS may be used as base stations within the terrestrial component of IMT-2000 in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2; the use by IMT-2000 applications using HAPS as base stations does not preclude the use of these bands by any station in the services to which they are allocated and does not establish priority in the Radio Regulations.

Resolution **221** from WRC-2000 includes provisional co-channel and out-of-band power-flux density limits for HAPS operation, for the protection of other stations either sharing the same band or operating in adjacent bands and asked for additional technical, operational and regulatory studies to be conducted, in order to review and, if necessary, revised, these limits. Resolution **221** also asks for consideration of appropriate regulatory and technical provisions to allow bilateral co-ordination of HAPS in an IMT-2000 system with affected neighbouring administrations.

Based on updated information on typical noise figure of IMT-2000 mobile stations, WP-8F updated the protection requirement of other IMT-2000 stations operating co-frequency has been revised to - 117 dB (W/(m<sup>2</sup>·MHz)). This PFD threshold is appropriate to protect other IMT-2000 mobile stations from co-channel interference.

In order to adequately protect MMDS within IMT-2000 in some neighbouring countries in Region 2 in the band 2 150-2 160 MHz from co-channel interference, a HAPS operating as a base station to provide IMT-2000 shall not exceed the following co-channel pfd at the Earth's surface outside an administration's borders unless agreed otherwise by the administration of the affected neighbouring country:

- 127 dB(W/(m<sup>2</sup>·MHz))for angles of arrival ( $\theta$ ) less than 7° above the horizontal plane;
- 127+ 0.666 ( $\theta - 7$ ) dB(W/(m<sup>2</sup>·MHz))for angles of arrival between 7° and 22° above the horizontal plane; and
- 117 dB(W/(m<sup>2</sup>·MHz)) for angles of arrival between 22° and 90° above the horizontal plane.

It is to be noted that the above is an issue concerning the protection from co-channel interference of certain stations in some neighbouring countries in Region 2 only.

**Proposal:**

**USA/ /1        MOD**

**RESOLUTION 221 (WRC-200003)**

**Use of high altitude platform stations as base stations providing IMT-2000 in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2**

The World Radiocommunication Conference (~~Istanbul, 2000~~), (Geneva, 2003),

*considering*

- a) that the bands 1 885-2 025 MHz and 2 110-2 200 MHz are identified in No. **5.388** as intended for use on a worldwide basis for International Mobile Telecommunications-2000 (IMT-2000), including the bands 1 980-2 010 MHz and 2 170-2 200 MHz for both the terrestrial and the satellite component of IMT-2000;
- b) that a high altitude platform station (HAPS) is defined in No. **1.66A** as “a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth”;
- c) that HAPS may offer a new means of providing IMT-2000 services with minimal network infrastructure as they are capable of providing service to a large footprint together with a dense coverage;
- d) that the use of HAPS as base stations within the terrestrial component of IMT-2000 is optional for administrations, and that such use should not have any priority over other terrestrial IMT-2000 use;
- e) that in accordance with No. **5.388** and Resolution **212 (Rev.WRC-97)**, administrations may use the bands identified for IMT-2000, including the bands referred to in this Resolution, for stations of other primary services to which they are allocated;
- f) that these bands are allocated to the fixed and mobile services on a co-primary basis;
- ~~g) that ITU R has studied sharing and coordination between HAPS and other stations within IMT-2000, has considered compatibility of HAPS within IMT 2000 with some services having allocations in the adjacent bands, and has established Recommendation ITU R M.1456;~~
- ~~h) that ITU R did not address sharing and coordination between HAPS and some existing systems, particularly PCS (personal communications service), MMDS (multichannel multipoint distribution~~

~~system) and systems in the fixed service, which are currently operating in some countries in the bands 1 885-2 025 MHz and 2 110-2 200 MHz;~~

~~i)g) that in accordance with No. 5.388A, HAPS may be used as base stations within the terrestrial component of IMT-2000 in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2; the use by IMT-2000 applications using HAPS as base stations does not preclude the use of these bands by any station in the services to which they are allocated and does not establish priority in the Radio Regulations,~~

~~recognizing~~

~~that the values in resolves 1 may not be appropriate for the protection of some stations operating in these bands in the fixed and mobile services;~~

~~h) that ITU-R has studied sharing and coordination between HAPS and other stations within IMT-2000, has considered compatibility of HAPS within IMT-2000 with some services having allocations in the adjacent bands, and has established Recommendation ITU-R M.1456;~~

~~i) that ITU-R has addressed sharing and coordination between HAPS and some existing systems, particularly PCS (personal communications service), MMDS (multichannel multipoint distribution service) and systems in the fixed service, which are currently operating in some countries in the bands 1 885-2 025 MHz and 2 110-2 200 MHz;~~

~~j) that HAPS stations are intended to transmit in the band 2 110-2 170 MHz in Regions 1 and 3 and in the band 2110-2160 MHz in Region 2~~

~~resolves~~

~~1 that:~~

~~1.1 for the purpose of protecting certain IMT-2000 mobile stations operating within IMT-2000 in neighbouring countries from co-channel interference, a HAPS operating as a base station to provide IMT-2000 shall not exceed a provisional threshold of co-channel power-flux density (pfd) of  $-121.5 \text{ dB}(\text{W}/(\text{m}^2 \cdot \text{MHz}))$   $-117 \text{ dB}(\text{W}/(\text{m}^2 \cdot \text{MHz}))$  at the Earth's surface outside an administration's borders unless agreed otherwise by the consulted administration of the affected neighbouring country;~~

~~1.2 a HAPS operating as a base station to provide IMT-2000, in order to protect fixed stations from interference, shall not exceed the following provisional values of out of band pfd at the Earth's surface in the bands 2 025-2 110 MHz:~~

~~1.2 for the purpose of protecting MMDS stations in some neighbouring countries in Region 2 in the band 2 150-2 160 MHz from co-channel interference, a HAPS operating as a base station to provide IMT-2000 shall not exceed the following co-channel power-flux density (pfd) threshold at the Earth's surface outside an administration's borders unless agreed otherwise by the consulted administration of the affected neighbouring country:~~

~~\_\_\_\_\_ -165 dB(W/(m<sup>2</sup> · MHz)) \_\_\_\_\_ -127 dB(W/(m<sup>2</sup> · MHz)) for angles of arrival (θ) less than 5°<sup>7</sup>° above the horizontal plane;~~

~~\_\_\_\_\_ -127 + 0.666 (θ - 7) dB(W/(m<sup>2</sup> · MHz)) for angles of arrival between 7° and 22° above the horizontal plane; and~~

~~\_\_\_\_\_ -117 dB(W/(m<sup>2</sup> · MHz)) for angles of arrival between 22° and 90° above the horizontal plane;~~

~~\_\_\_\_\_ -165 + 1.75 (θ - 5) dB(W/(m<sup>2</sup> · MHz)) for angles of arrival between 5° and 25° above the horizontal plane; and~~

~~\_\_\_\_\_ -130 dB(W/(m<sup>2</sup> · MHz)) for angles of arrival between 25° and 90° above the horizontal plane;~~

1.3 a HAPS operating as a base station to provide IMT-2000, in order to protect fixed stations from interference, shall not exceed the following limits of out-of-band power-flux density (pfd) at the Earth's surface in the bands 2 025-2 110 MHz:

~~\_\_\_\_\_ -165 dB(W/(m<sup>2</sup> · MHz))for angles of arrival (θ) less than 5° the horizontal plane;~~

~~\_\_\_\_\_ -165 + 1.75 (θ - 5) dB(W/(m<sup>2</sup> · MHz)) for angles of arrival between 5° and 25° above the horizontal plane; and~~

~~\_\_\_\_\_ -130 dB(W/(m<sup>2</sup> · MHz)) for angles of arrival between 25° and 90° above the horizontal plane;~~

~~2 \_\_\_\_\_ that, as of the end of WRC-03, such a HAPS shall operate only in accordance with such limits as are confirmed or, if appropriate, revised by WRC-03, irrespective of its date of bringing into use;~~

2 that, as of the end of WRC-03, such a HAPS shall operate only in accordance with such power-flux density (pfd) values as are confirmed by WRC-03, irrespective of its date of bringing into use;

3 that the consultation with neighboring administrations, as mentioned in Resolves 1, be conducted taking into account ITU-R Rec. [(HAPS CON)] under development;

~~4 \_\_\_\_\_ that administrations wishing to implement HAPS within a terrestrial IMT-2000 system shall, prior to their bringing into use, take into account in their bilateral coordination with affected neighbouring administrations the operation and growth of existing and planned systems in the fixed and mobile services having allocations on a primary basis;~~

34 that administrations wishing to implement HAPS within a terrestrial IMT-2000 system shall comply with the following:

34.1 for the purpose of protecting certain stations operating within IMT-2000 in neighbouring countries from co-channel interference, administrations using HAPS as base stations within IMT-2000 shall use antennas that comply with the following antenna pattern:

$$G(\psi) = G_m - 3(\psi/\psi_b)^2 \quad \text{dBi} \quad \text{for} \quad 0^\circ \leq \psi \leq \psi_1$$

$$G(\psi) = G_m \mathcal{L}_N \quad \text{dBi} \quad \text{for} \quad \psi_1 < \psi \leq \psi_2$$

$$G(\psi) = X - 60 \log(\psi) \quad \text{dBi} \quad \text{for} \quad \psi_2 < \psi \leq \psi_3$$

$$G(\psi) = L_F \quad \text{dBi} \quad \text{for} \quad \psi_3 < \psi \leq 90^\circ$$

where:

$G(\psi)$  : gain at the angle  $\psi$  from the main beam direction (dBi)

$G_m$  : maximum gain in the main lobe (dBi)

$\psi_b$  : one-half of the 3 dB beamwidth in the plane considered (3 dB below  $G_m$ ) (degrees)

$L_N$  : near side-lobe level in dB relative to the peak gain required by the system design, and has a maximum value of -25 dB

$L_F$  : far side-lobe level,  $G_m - 73$  dBi

$$\psi_1 = \psi_b \sqrt{-L_N/3} \quad \text{degrees}$$

$$\psi_2 = 3.745 \psi_b \quad \text{degrees}$$

$$X = G_m \mathcal{L}_N + 60 \log(\psi_2) \quad \text{dBi}$$

$$\psi_3 = 10^{(X-L_F)/60} \quad \text{degrees}$$

The 3 dB beamwidth ( $2\psi_b$ ) is again estimated by:

$$(\psi_b)^2 = 7442/(10^{0.1G_m}) \quad \text{degrees}^2$$

where  $G_m$  is the peak aperture gain (dBi);

34.2 for the purpose of protecting mobile earth stations within the satellite component of IMT-2000 from interference, a HAPS operating as a base station to provide IMT-2000, shall not exceed an out-of-band pfd of  $-165 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$  at the Earth's surface in the bands 2 160-2 200 MHz in Region 2 and 2 170-2 200 MHz in Regions 1 and 3;

45 that administrations wishing to implement HAPS within a terrestrial IMT-2000 system shall, prior to their bringing into use, take into account in their bilateral coordination with affected

neighbouring administrations the operation and growth of existing and planned systems in the fixed and mobile services having allocations on a primary basis;

56 that, for the purpose of protecting fixed service stations operating in neighbouring countries from co-channel interference, administrations wishing to implement HAPS within a terrestrial IMT-2000 system shall, ~~pending the review by WRC-03 of the studies mentioned below,~~ take full account of the relevant ITU-R Recommendations relating to protection values for fixed stations (see Recommendation ITU-R F.758),

*invites ITU-R*

~~1 — to complete, as a matter of urgency, additional regulatory, operational and technical studies on sharing criteria for HAPS with other systems in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2, and in adjacent bands, so as to allow revision of the values in *resolves* 1;~~

~~2 — to develop appropriate regulatory and technical provisions to allow the coordination mentioned in *resolves* 4;~~

~~3 — to report on the results of these studies in time for consideration by WRC-03.~~

**Reasons:** The ITU-R has addressed sharing and coordination between HAPS and existing systems, particularly IMT-2000 stations operating in adjacent countries and MMDS (multichannel multipoint distribution service), which are currently operating in the bands 1 885-2 025 MHz and 2 110-2 200 MHz. The resolution is being modified to reflect the conclusions of the studies and the PFD thresholds required updating. Some of the proposed “block” edits to Resolution **221** are merely to re-organize the text into a more logical manner.

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